



## Non-surgical management of hip and knee osteoarthritis; comparison of ACR/AF and OARSI 2019 and VA/DoD 2020 guidelines



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### ARTICLE INFO

#### Keywords:

ACR/AF

Hip

Knee

OARSI

Osteoarthritis

VA/DoD

### ABSTRACT

**Background and objectives:** Osteoarthritis (OA) is the most common form of arthritis and is associated with significant morbidity and mortality. There are several available recently updated guidelines for the management of hip and knee OA. Herein, we describe the similarities and differences among the 2019 American College of Rheumatology/Arthritis Foundation (ACR/AF), the 2019 Osteoarthritis Research Society International (OARSI), and the 2020 Veterans Affairs and Department of Defense (VA/DoD) treatment guidelines.

**Results:** In all the three guidelines, patient education, weight loss encouragement for overweight patients, exercise, and self-efficacy and self-management programs were considered core treatments for hip and knee OA. Topical NSAIDs are strongly recommended for knee OA, oral NSAIDs and intraarticular steroid injections are also recommended among all three guidelines. The ACR/AF and VA/DoD recommend the use of paracetamol and topical capsaicin in contrast to the OARSI guidelines. Intra-articular hyaluronic acid is not recommended by the ACR/AF in contrast to the OARSI and VA/DoD. Another difference is the use of tramadol in patients with persistent knee or hip OA pain, which is recommended by ACR/AF as opposed to VA/DoD and OARSI who recommend against the use of opioid analgesics without exceptions.

**Conclusion:** All three guidelines are mostly consistent in their recommendations.

### 1. Introduction (OA)

Osteoarthritis (OA) is the most common form of arthritis [1]. Over 300 million people are affected by OA worldwide [2–4]. Osteoarthritis is caused by cartilage degradation and changes in subchondral bone, leading to osteophytes formation and local synovial inflammation. This leads to developing pain, physical limitation, and disability [5]. Hence, OA is associated with significant morbidity, physical disability, increased cost of treatment, and most importantly, increased mortality rates [6].

There have been several pharmacologic treatments approved by the U.S Food and Drug administration (FDA) and European Medicines Agency (EMA) for OA, mainly directed toward symptomatic management [7–11]. There continues to be a lack of effective disease-modifying treatments for hip and knee OA [12].

Clinical practice guidelines have been developed to help provide health-care providers with guidelines that assist them in their medical

management of OA [13–15]. Recommendations are divided into non-pharmacological, pharmacological, and surgical options. Most guidelines share the same core treatment recommendations for knee and hip OA. These include patient education, weight loss encouragement for overweight patients, exercise, self-efficacy, and, self-management programs. Following core treatments, guidelines generally recommend the use of topical and oral analgesics, intra-articular injections, and lastly, surgical replacement.

In 2012, the American College of Rheumatology (ACR) published evidence-based recommendations for the management of hip and knee OA [8]. The Osteoarthritis Research Society International (OARSI) published recommendations in 2014 outlining the treatment algorithm for patients with hip and knee OA, which summarized the expert opinion as well as high-quality data to outline a staged approach for healthcare providers [9]. Similarly, in 2014, the Office of the Veterans Affairs and Department of Defense (VA/DoD) developed general guidelines and

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<https://doi.org/10.1016/j.ocarto.2021.100232>

Received 28 July 2021; Received in revised form 6 November 2021; Accepted 20 December 2021

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recommendations for the management of patients with hand, hip, and knee OA [16]. In 2019, the ACR/AF and OARSI updated their recommendations for the non-surgical management of knee and hip OA [13, 14]. The VA/DoD updated their recommendations in 2020 [15].

In this article, we highlight the similarities and differences among the methodologies and treatment recommendations in the ACR/AF, OARSI, and VA/DoD.

## 2. Comparison of aims and objectives

The ACR is an international organization of physicians and health professionals specialized in rheumatology that advances rheumatology through programs of education, research, and practice support to improve the care of patients with arthritis and rheumatic and musculoskeletal diseases. The Arthritis Foundation (AF) is a non-profit international organization that is dedicated to addressing the needs of patients with arthritis in the United States. It aims to promote research and education relating to the prevention, diagnosis, and treatment of osteoarthritis and other rheumatic diseases.

The OARSI is an international non-profit scientific organization that aims to develop and advance research for the prevention and treatment of osteoarthritis. The Office of the VA/DoD (Veterans Affairs and Department of Defense) Health Affairs (OHA) serves as the Veterans Health Administration (VHA) lead in coordinating and facilitating collaboration activities and initiatives with the Department of Defense (DoD) Military Healthcare System (MHS). The OARSI, ACR in collaboration with AF and the VA/DoD guidelines were developed to provide clinicians with practical algorithms that can help with their decision-making approach for the management of patients with hip and knee OA. All guidelines aimed to develop patient-centered approaches for clinicians.

The ACR/AF guidelines [13] updated the 2012 ACR recommendations for the management of OA [8]. Similarly, the OARSI guidelines [14] updated and expanded the previous OARSI guidelines [9]. The VA/DoD developed new recommendations [15] and updated the 2014 VA/DoD OA recommendations [16]. While the 2019 ACR/AF guidelines include the hand, hip, and knee OA, both OARSI and VA/DoD focus on the hip and knee OA only. OARSI also includes guidelines for polyarticular OA. All three guidelines exclusively include non-surgical management recommendations. In this article, we focus on non-surgical management guidelines for hip and knee OA.

## 3. Comparison of methodologies

In this section, we describe the similarities and differences in the methods used by the ACR/AF, OARSI, and the VA/DoD guidelines. In general, the methods used were overall similar with some differences. Key differences were in the voting panel, literature search strategies, and scaling the treatment recommendations. Table 1 summarizes the similarities and differences in the methodologies.

### 3.1. Assessing the quality of evidence

The Grading of Recommendations Assessment, Development and Evaluation (GRADE) methodology [17] was used to rate the quality of evidence in the 2019 ACR/AF guidelines, 2019 OARSI guidelines, and the 2020 VA/DoD guidelines. The GRADE methodology combines both the literature review as well as expert opinions [18]. One major difference that ACR/AF and OARSI both have developed new meta-analyses to inform their GRADE assessment, whereas the VA/DoD used published meta-analyses.

### 3.2. Selection of the expert panels

The ACR/AF, VA/DoD, and OARSI [13–15] recognize the importance of having multiple disciplines' inputs. Health care providers from various

specialties as well as patient representatives contributed to the development of treatment guidelines. However, there are some differences in the structure of each workgroup. While the VA/DoD workgroup only included members from the U.S, the ACR/AF working group included members from the United States U.S, and Canada. The OARSI workgroup consisted of members from the United Kingdom (UK), Europe, North America, South America, Australia, and Asia.

The ACR/AF workgroup consisted of 5 main teams; 1) a core leadership team of 6 individuals; 2) a literature review panel of 10 individuals; 3) a core expert panel of 11 members supervised the project; 4) a voting panel of 15 members including rheumatologists, internists, physical and occupational therapists; and 5) a panel of patient representatives. The OARSI group was comprised of a core expert panel of 6 members who supervised the project, 5 individuals were in the literature review panel, and 13 members were in the voting panel. The OARSI workgroup included rheumatologists, primary care physicians, orthopedic surgeons, pharmacists, sport medicine specialists, epidemiologists, physical medicine, and rehabilitation specialists, as well as patient representatives. By contrast, the VA/DoD workgroup included a single panel of 40 individuals, among which 3 individuals were the clinical leaders of the workgroup (Champions). Members were from different organizations, including the Department of Veterans Affairs (VA), DoD, Office of Quality and Patient Safety (OQPS), Veterans Health Administrations (VHA), Office of Evidence-Based Practice, U.S Army Medical Command, The Lewin Group, ECRI, Sigma Health Consulting, Anjali Jain Research and Consulting and Duty First Consulting. The workgroup team included different specialties: primary care, nursing, physical therapy, clinical pharmacology, internal medicine, dietetics, orthopedic surgery, rheumatology, family medicine, sports medicine, physical medicine and rehabilitation, and pain management. There was also a peer review group that provided feedback to drafted guidelines and also patient representatives.

### 3.3. Declaring competing interests

For ACR/AF, the conflicts of interest (COI) were managed by the adherence to the ACR COI policy and disclosures. Whereas the OARSI COI was guided by the OARSI Ethics Committee guidelines. Individuals with high competing interests (e.g., industry employment, close involvement with a manufacturer of a product), were excluded in both the ACR/AF and OARSI. Regarding the VA/DoD COI disclosures, all project team members were required to submit their disclosures; among all members, there was no COI identified. If any were identified, then it would have been reported and discussed by the VA and DoD program offices as well as the OA Clinical Practice Guidelines (CPG) Champions to determine the appropriateness of further action.

### 3.4. Literature searches

The ACR/AF, OARSI, and VA/DoD have developed an extensive systematic review analysis and adhered to predefined methodology to formulate their recommendations. The OARSI team included systematic reviews (SRs), meta-analyses, and randomized controlled trials. While the ACR/AF included only Randomized Controlled Trials (RCTs) unless exceptionally, like in some instances, the evidence from systematic reviews was used as supplementary evidence if it provided data from RCTs and observational studies or observational study data alone that was particularly relevant. The VA/DoD included SRs and RCTs. Their methodologies had some differences in some aspects.

One difference between the ACR/AF, OARSI, and VA/DoD is that both ACR/AF and OARSI have developed a list of priority questions using the PICO (Population, Intervention, Control, and Outcome) format, which is an effective approach for identifying high-quality evidence [19]. The VA/DoD, however, used the PICOTS (Patient population, Intervention, Comparison, Outcome, Timing, and Setting) format, which is another effective approach for reporting high-quality evidence [20].

**Table 1**  
Comparison of methodologies used to develop recommendations for non-surgical management of knee and hip OA.

	ACR/AF	OARSI	VA/DoD
Objectives	To formulate an evidence-based guidelines for the management of (OA) and, update the 2012 ACR recommendations for the management of hand, hip, and knee OA to guide patients and clinicians in choosing among the available treatment options	To perform an updated review of the literature and to expand upon prior OARIS guidelines by developing patient-centered treatment recommendations for hip, knee, and polyarticular OA. Besides, it provides guidance for the treatment of four subgroups of comorbidities that are common in OA patients	To improve the management of OA among patients eligible to receive care in the VA and/or DoD healthcare systems by developing general guidelines and updating the 2014 recommendations for the management of patients with hip and knee OA
Panels	The ACR/AF workgroup included rheumatologists, internists, physical and occupational therapists, and patient representatives A core leadership team of 6 members lead the work, a core expert panel of 11 members supervised the project, 15 members were included in the voting panel and 10 individuals comprised the literature review panel	The OARSI workgroup included rheumatologists, primary care physicians, orthopedic surgeons, pharmacists, sport medicine specialists, epidemiologists, physical medicine and rehabilitation specialists as well as patient representatives A core expert panel of 6 members supervised the project, 13 members were in the voting panel and 5 individuals were in the literature review panel	The VA/DoD workgroup included 40 individuals from different organizations including 3 champion leaders. The workgroup included different specialties: primary care, nursing, physical therapy, clinical pharmacology, internal medicine, dietetics, orthopedic surgery, rheumatology, family medicine, sports medicine, physical medicine and rehabilitation, and pain management. There was also a peer review group that provided feedbacks to drafted guidelines as well as patient representatives
Literature search	Database search included OVID Medline, PubMed, EMBASE, and the Cochrane Library GRADE criteria were used to rate the quality of evidence Search items include but not limited to, 'osteoarthritis', 'osteoarthrosis', 'degenerative arthritides', 'non-inflammatory arthritis', 'aerobic exercise', 'aquatic therapy', 'hip', 'knee' Original searches were run from the inception of databases to 10/15/17. Updates were run from 10/15/17 to 8/1/18 A meta-analysis of the reviewed manuscripts was done	Database search included Medline, EMBASE, Cochrane, PubMed, Google Scholar Modified GRADE criteria were used to rate the quality of evidence Search items include but not limited to, 'osteoarthritis', 'arthroplasty', 'arthrosis', 'randomized controlled trials', 'controlled trial', 'single-blind', 'double-blind' The literature search covered the period until December 2017 and there was no start date A meta-analysis of the reviewed manuscripts was done	Database search was Cochrane, EMBASE, Medline PreMedline, PubMed and AHRQ website Modified GRADE criteria were used to rate the quality of evidence Search items include but not limited to, 'osteoarthritis', 'hip', 'knee', 'arthrosis', 'degenerative joint', 'intraarticular', 'cutaneous administration', 'opiate', 'hip replacement', 'knee replacement' The literature search period was from December 1, 2012 to June 3, 2019 A meta-analysis of the reviewed manuscripts was not done
Voting procedure	Voting procedure was done via group emails and two-day face-to-face meeting	Voting was carried online using an anonymous survey application	Voting procedure was not specified
Strength of recommendations	A strong recommendation means that >75% of the voting panel recommended this intervention without reservations. A conditional recommendation means that between 50 and 75% recommended the intervention and that needed to be discussion of the benefits and risks with the patient. Recommendations are considered strong if they have high or moderate-quality evidence. Low-quality evidence mandates a weak recommendation	Recommendations were considered strong if $\geq 75\%$ of the voting panel voted either for or against. Considered conditional if 26–74% of the panel voted for or against	Recommendations were considered strong if it indicates high confidence in the quality of the available scientific evidence, the clear difference between harms and benefits, similar provider and patient preferences, and understood influence of other implications like feasibility and resource use

ACR/AF, American College of Rheumatology/Arthritis Foundation; AHRQ, Agency for Healthcare Research and Quality; GRADE, The Grading of Recommendations Assessment, Development and Evaluation; OA, Osteoarthritis; OARSI, The Osteoarthritis Research Society International; VA/DoD, Veterans Affairs and Department of Defense.

The OARSI workgroup has formulated 67 PICO questions for knee OA focused on the possible harms and benefits of pharmacologic (31 questions), non-pharmacologic (24 questions), and nutraceutical treatment (12 questions) options and 60 PCIO questions for hip OA among which were 24 pharmacologic questions, 24 non-pharmacologic questions, and 12 nutraceutical treatment questions. The VA/DoD workgroup has developed 12 OA-related key questions (KQs) for the PCIOTS framework. The KQs focused on the possible harms and benefits of pharmacologic (5 questions), non-pharmacologic (5 questions), and nutraceutical treatment (1 question) options. One question was about diagnostic testing. The details of the PCIO questions used by the ACR/AF were not mentioned; however, it focused on the pharmacologic therapies available and also on agents that are available in pharmaceutical-grade formulations, thus eliminating the nutraceuticals.

All three organizations' workgroups used PubMed, EMBASE, Cochrane, and Medline databases to search and identify relevant manuscripts. The ACR/AF search also included the OVID database [13]. The

OARSI search also included Google Scholar [14] and the VA/DoD used the Agency for Healthcare Research and Quality (AHRQ) website for further searching [15].

The ACR/AF literature review panel searched the aforementioned databases using search terms including but not limited to 'osteoarthritis', 'osteoarthrosis', 'degenerative arthritides', 'non-inflammatory arthritis', 'aerobic exercise', 'aquatic therapy', 'hip', 'knee'. Original searches were run from the inception of databases to 10/15/17. Updates were run from 10/15/17 to 8/1/18. The search terms used by the OARSI literature review team include but are not limited to 'osteoarthritis', 'arthroplasty', 'arthrosis', 'randomized controlled trials', 'controlled trial', 'single-blind', 'double-blind'. The literature search covered the period until December 2017 and there was no start date. Whereas the VA/DoD workgroup used search terms including 'osteoarthritis', 'hip', 'knee', 'arthrosis', 'degenerative joint', 'intraarticular', 'cutaneous administration', 'opiate', 'hip replacement', 'knee replacement'. The literature search period was from December 1, 2012, to June 3, 2019.

**Table 2**  
Translating voting data into the treatment algorithm in the ACR/AF guidelines.

Direction	Level	Implications
>75% voted in favor	Strong recommendation	Most patients should receive the intervention as first-line therapy
50–75% voted in favor	Conditional recommendation	Treatment should be reserved for patients who either fail to improve sufficiently or can not tolerate first-line therapy.

The OARSI team screened both abstracts and full texts of the identified publications, in contrast to the VA/DoD team which included only full clinical studies or SR. The ACR/AF team did not specify whether the abstracts were included or not.

### 3.5. Voting procedures

In the ACR/AF workgroup, the data from different studies were combined and presented in GRADE summary-of-findings tables. During a two-day face-to-face meeting and by group emails, Voting Panel members voted on the direction (for or against) and strength (conditional or strong) of the recommended interventions related to the PICO questions. Recommendations required a 70% level of agreement similar to previous other processes [21]. If the 70% agreement was not achieved during the initial vote, the panel members held further discussions followed by re-voting. A strong recommendation means that >75% of the voting panel recommended this intervention without reservations. A conditional recommendation means that between 50 and 75% recommended the intervention and that needed to be discussion of the benefits and risks with the patient. A strong recommendation was considered if the voting panel was confident that the desirable effects of the intervention significantly outweigh the undesirable effects. Conditional recommendations were made when the quality of evidence was proved low or very low, or when the balance between harms and benefits is close [13](Table 2).

In the ORASI workgroup, the core expert panel reviewed all documents gathered from the systematic literature search and the GRADE evidence tables for each intervention directed to answer the PICO questions. After that, the voting panel was given access to all the documents, including the date, analysis, and GRADE tables. They were asked to vote on the recommendations via an online electronic system. There was also additional discussion and debating, followed by the second stage of voting. The first stage of voting was for inclusion or exclusion of the few selected recommendations. Those recommendations who were selected after the first stage voting were named ‘core treatment’. The second stage consisted of three rounds of voting. The voting panel was asked to vote on the directionality (in favor or against) and the strength (strong or conditional) using the modified GRADE criteria (Table 3).

Regarding the VA/DoD voting process, after the literature search and data collection, the Lewin team met with the Champions, the Contracting Officer's Representative (COR), and the workgroup for a three- and one-half day meeting to develop and draft the guideline recommendations. And to update the 2014 VA/DoD recommendations to reflect new and amended recommendations. The Lewin group presented the findings of the systematic evidence review to facilitate the process. In addition to drafting the recommendations, the workgroup assigned ratings for each recommendation based on the modified GRADE and USPSTF methodology [22]. Strong recommendations are considered when it meets the requirements in 4 main domains: high confidence in the quality of the available scientific evidence, a clear difference between the benefits and harms of the intervention, similar provider and patient preferences, and understood the influence of other implications like feasibility and resource use. Weak recommendations are considered if the workgroup has less confidence after assessing the four main domains.

One major difference between the VA/DoD and OARSI is that the VA/DoD workgroup specifies: ‘No recommendation for or against’ the

**Table 3**  
Translating voting data into the treatment algorithm in the OARSI guidelines.

Direction	Strength	Level	Implications
≥75% voted in favor	>50% voted strong	1A	First-line treatment strongly recommended
≥75% voted in favor	>50% voted conditional	1B	First-line treatment conditionally recommended
60–74% voted in favor	Conditional by default	2	Conditionally recommended
41–59% voted in favor	Conditional by default	3	Conditionally not recommended
60–47% voted against	Conditional by default	4A	Conditionally not recommended
≥75% voted against	>50% voted conditional	4B	Conditionally not recommended
≥75% voted against	>50% voted strong	5	Strongly not recommended

intervention when there is insufficient evidence to make the recommendation for or against it. At the same time, the OARSI specified that when there is a lack of adequate evidence for the specified intervention, the evidence quality score for that intervention will be considered ‘very low’ by default. In the ACR/AF workgroup, when the literature provided very limited evidence, the experience of the Voting Panel members in managing the relevant patients, along with patient values derived from input from the members of the Patient Panel, was particularly significant.

## 4. Comparison of recommendations

Despite the differences in the methodology among the three groups, their final recommendations shared several aspects for the non-surgical management for hip and knee OA. In this section, we outline the similarities and differences among the ACR/AF, OARSI, and VA/DoD updated guidelines.

### 4.1. Similarities

#### 4.1.1. Core treatments appropriate for use in the majority of patients

In all three groups, patient education, weight loss encouragement for overweight patients, exercise, self-efficacy, and self-management programs should be the core treatments for hip and knee OA [13–15]. The ACR/AF guidelines recommend exercise, including walking, strengthening, neuromuscular training, thermal therapies, and aquatic exercise, with no hierarchy of one over another. In addition to the above-mentioned exercise, it also recommends physical, occupational therapy, and self-efficacy, and self-management training with mind-body approaches. Similarly, OARSI guidelines recommend structured and land-based programs as well as mind-based exercises, including yoga and Tai Chi. The OARSI guidelines exclude aquatic therapy exercises from core treatment due to accessibility concerns. The workgroup for the VA/DoD determines that various exercise therapy approaches are helpful in hip or knee OA and showed significant improvements in pain and function at short-term follow-up. However, it could not recommend a specific type of exercise therapy over another. The VA/DoD also recommends that bracing for OA of the knee should be considered among the core treatments as well as referral to physical therapy.

#### 4.1.2. First-line treatments

Following core treatments, the ACR/AF, OARSI, and VA/DoD strongly recommend topical NSAIDs as the first-line treatment for knee OA (its unclear whether it will be helpful for hip OA due to the depth of the joint and unlikely that a topical therapy will confer benefit)<sup>13, 14 15</sup>. Additionally, the ACR/AF strongly recommends oral NSAIDs [23] and intraarticular corticosteroid injection (CSI) [24] for both hip and knee OA with a strong recommendation to use the ultrasound to guide hip injections. However, it strongly recommends against the use of

glucosamine [25], chondroitin sulfate products, and platelet-rich plasma (PRP) injections. It conditionally recommends against the use of vitamin D and intra-articular hyaluronic acid injections (IAHA) [7].

Similar to ACR/AF the ORASI workgroup strongly recommends against the use of glucosamine [25], chondroitin sulfate products. It conditionally recommends against the use of topical capsaicin for knee OA, paracetamol for knee and hip OA, duloxetine for hip OA, opioids for knee and hip OA [26], and vitamin D for knee and hip OA.

Unlike the OARSI, the VA/DoD recommends the use of topical capsaicin for knee OA. It also recommends acetaminophen, oral NSAIDs, and COX-2 inhibitors as first-line therapy.

#### 4.1.3. Persistent symptoms

For patients with hip or knee OA with persistent symptoms despite first-line therapy or those with relative contraindications to first-line treatment, the ACR/AF conditionally recommends the use of topical capsaicin for knee OA, oral acetaminophen [23], and duloxetine. The ACR/AF conditionally recommends the use of tramadol for both hip and knee OA. It, however, recommends against non-tramadol opioids. The OARSI group conditionally recommends oral NSAIDs and intra-articular corticosteroid injections for patients with knee and hip OA who fail to respond or cannot receive the first-line therapies and duloxetine for knee OA. Intra-articular hyaluronic acid was conditionally recommended for knee OA in contrast to the ACR/AF recommendations. And conditionally recommends against for the hip OA. Regarding the VA/DoD recommendations, when first-line therapies fail or become inadequate, it recommends the use of a combination of two of the initial therapies, consider CSI for the knee and hip (with ultrasound guidance for hip CSI), intra-articular viscosupplementation injections [27] for knee OA or duloxetine. Like OARSI, it weakly recommends against the use of all opioids, including tramadol for patients with knee or hip OA with persistent symptoms. It neither recommends with nor against PRP injections, glucosamine, chondroitin sulfate.

#### 4.2. Differences

Despite general similarities in treatment guidelines among the three different groups. There are several differences that we expand and discuss in detail in this section. Table 4 summarizes the main differences.

##### 4.2.1. First-line treatments

Both ACR/AF and VA/DoD recommend the use of paracetamol in their recommendations for knee and hip OA [13–15]. In contrast, the OARSI recommendations advise against the use of paracetamol for hip

and knee OA both in the short and long term [14]. There were some differences regarding the recommendations for the use of symptomatic slow-acting drugs for osteoarthritis (SYSADOAs). While both ACR/AF and VA/DoD strongly advise against the use of chondroitin products and glucosamine, the VA/DoD neither recommends with nor against its use. The use of topical capsaicin was recommended by the ACR/AF and VA/DoD treatment guidelines but was recommended against in the OARSI.

##### 4.2.2. Final pharmacological treatments before surgery

Unlike the VA/DoD and OARSI, ACR/AF recommends the use of tramadol among all opioids for the treatment of hip or knee OA with persistent symptoms or for patients among certain circumstances when alternatives have been exhausted [13–15]. The VA/DoD and OARSI recommend against the use of all opioids without exceptions. Opioids are recommended against due to the modest benefits of long-term therapy and high risk of toxicity and dependence. Regarding the use of duloxetine, all three guidelines recommend its use except for hip OA as the OARSI recommends against its use. Regarding the IAHA injections, all three guidelines recommend against their use in hip OA. The difference was in the recommendations for the use of IAHA in knee OA where the ACR/AF recommends against it. The use of PRP injections is strongly recommended against in the ACR/AF. It was neither recommended for nor against in the VA/DoD and it wasn't specified in the OARSI guidelines.

##### 4.2.3. Other differences

There were also variable differences regarding the use of acupuncture, yoga, Tai Chi, massage therapy. Acupuncture is conditionally recommended by ACR/AF and recommended against by the OARSI. Tai Chi and Yoga are recommended by ACR/AF and OARSI. Massage therapy is recommended by the OARSI, however, was recommended against by the ACR/AF. Those techniques were neither recommended nor against by the VA/DoD [13–15]. One major difference among guidelines is that the VA/DoD recommends against the use of magnetic resonance imaging (MRI) for the diagnosis of hip and knee OA [15]. Recommendations for diagnostic imaging were not formulated by the ACR/AF or OARSI. While the ACR/AF focused on pharmacologic and pharmaceutical-grade formulations only, the OARSI has formulated recommendations including nutraceuticals. The VA/DoD neither recommends for nor against its use. Finally, the ACR/AF and VA/DoD guidelines included recommendations regarding the use of knee tibiofemoral and patellofemoral braces, and the OARSI did not include details regarding this.

**Table 4**

Differences in ACR/AF, OARSI and VA/DoD recommendations for the non-surgical management of hip and knee OA.

Level of stage	Intervention	ACR/AF	OARSI	VA/DoD
First-line treatment	Paracetamol	Conditional recommendation for knee and hip OA	Conditional recommendation against the use for knee and hip OA	Weak recommendation for use in the knee and hip OA
	SYSADOAs	Strong recommendation against the use of glucosamine and chondroitin formulations	Strong advice against the use of glucosamine and chondroitin formulations	Neither recommends for nor against it
	Topical capsaicin	Conditional recommendation for the use in knee OA	Conditional recommendation against the use in knee OA	Weak recommendation for the use in knee OA
Treatments in persistent symptoms	Opioids	Conditional recommendation for the use of tramadol, and against the use of non-tramadol medications for persistent knee and hip OA	Conditional recommendation against the use of opioids in the persistent knee and hip OA	Weak recommendation against the use of opioids in hip and knee OA with persistent symptoms
	Duloxetine	Conditional recommendation for the use of duloxetine in the persistent knee and hip OA	Conditional recommendation for the use of duloxetine in persistent knee OA and against the use in persistent hip OA	Weak recommendation for the use of duloxetine in hip and knee OA with persistent symptoms
	IAHA	Conditional recommendation against the use in hip and knee OA	Conditional recommendation against the use in hip OA.	Weak recommendation for the use in knee OA and weak recommendation against the use in hip OA

SYSADOAs, symptomatic slow-acting drugs for osteoarthritis.

## 5. Implications and perspectives

The 2019 ACR/AF, 2019 OARSI, and 2020 VA/DoD recommendations have proposed an outline algorithm for the non-surgical management of patients with knee or hip OA [13–15]. All recommendations were evidence-based or based on expert opinions when there was no enough evidence. Those algorithms are aimed to help healthcare providers in a patient-centered approach advises. All guidelines were similar in general and guidelines took patient characteristics and comorbidities into consideration which is of particular importance, particularly when prescribing NSAIDs, for example. In all three groups, core treatment guidelines were overall similar and included patient education, weight loss encouragement for overweight patients, exercise, self-efficacy, and self-management programs. NSAIDs (oral and topical) and intraarticular CSI were recommended by all the three guidelines among the first-line therapies.

The ACR/AF, OARSI and VA/DoD panels all examined nutraceuticals and dietary supplements. Among the many dietary supplements examined, including chondroitin sulfate and glucosamine, there was a consensus to recommend against their use because of either a lack of evidence or low-quality evidence supporting efficacy. This is particularly important as these products are not strictly regulated by the Food and Drug Administration for either safety and effectiveness. Furthermore, payment is usually out of pocket (ie. not covered by insurance). Nonetheless, patients who choose to use supplements should be provided adequate education by their providers regarding the potential drug-supplements interactions.

Overall, the above-mentioned treatment recommendations are consistent with other guidelines. The American Academy Of Orthopedic Surgeons (AAOS) released an updated guideline in 2021 for the non-arthroplasty management of knee OA [28]. The AAOS emphasizes the importance of patient education, sustained weight loss for overweight patients, self-management programs, supervised exercise including aquatic therapy, and neuromuscular training (balance, gait and coordination), as those measures can improve pain and function in patients with hip or knee OA. The AAOS strongly recommends oral and topical NSAIDs as first-line treatments. Paracetamol use is strongly recommended, contrasted with the OARSI guidelines. The AAOS strongly recommends against the use of oral opioids, including tramadol. While the AAOS strongly recommends intra-articular CS injections, the routine use of hyaluronate injections is not recommended. The AAOS had limited evidence for the use of PRP injections. No recommendations regarding the use of duloxetine or topical capsaicin were mentioned.

The European League of Associations for Rheumatology (EULAR) published updated recommendations in 2018 emphasizing the importance of non-pharmacologic management, including physical therapy, as an integral part of standard care for patients with hip and knee OA [29]. These recommendations updated the original EULAR recommendations for the non-pharmacological core management of hip and knee osteoarthritis, originally released in 2013 [30].

Despite the similarities noted above, there is some variation between the ACR/AF, OARSI, and VA/DoD recommendations. The variation is likely due to differences in the methodologies of the systematic review and differences in the expert's interpretation of the available evidence. Despite evaluating similar data, some differences arose from the uncertainty in the available evidence. This indicates the need for more research in the future.

## 6. Conclusion

Overall, the ACR/AF, OARSI, and VA/DoD have developed and updated treatment algorithms for the non-surgical management of hip and knee OA with a similar outline. These recommendations, particularly in the area of core non-pharmacologic modalities, are consistent with other guidelines released by the AAOS and EULAR for the management of hip and knee OA in 2021 and 2018, respectively. The overlap in

recommendations among these organizations should provide confidence for healthcare providers in treating patients with hip and knee OA. There are some differences among treatment recommendations arising from differences in methodologies and certainty of the available evidence. The existence of such differences suggests that more research studies should be done to specifically study the efficacy of certain treatment options, as well as more coordination between national and international organizations regarding formulating common guidelines for the management of hip and knee OA. Moreover, there should be rigorous regulations nationally for the use of dietary supplements and nutraceuticals, given the potential drug-supplement interactions and the lack of enough evidence for its long-term safety.

## Funding/support

This study was not funded.

## IRB

This study is IRB exempt.

## Declaration of competing interest

No conflicts of interest.

## Acknowledgements

Nothing to acknowledge.

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